

TITLE

BUFFER STORAGE UNIT FOR TUBES, ESPECIALLY CARDBOARD TUBES FOR THE PRODUCTION OF LOGS

SPECIFICATION

5 The present invention refers to a storage unit for tubes, especially cardboard tubes for the production of logs.

A log is known to consist of a paper sheet of predetermined width and length, which is wound over a tubular cardboard core. The machines for the production of logs, so-called
10 "rewinders", therefore, provide for supplying paper as well as tubes over which the paper is to be wound. Upstream of the rewinders, the production of tubes, intended to make up the cores of the logs, is ensured by tube-forming machines. Provided downstream of the rewinders are further machines,
15 so-called cutting-off machines, by means of which the logs are subdivided into elements of reduced length, that, is, of commercial size.

The present invention refers in particular to the supply of tubes to be fed into the rewinders, and has the object of
20 supplying the latter with tubes in a constant, efficient and reliable manner.

This result has been achieved, according to the invention, by adopting the idea of making an apparatus having the characteristics indicated in the claim 1. Further
25 characteristics being set forth in the dependent claims.

The apparatus according to the present invention is relatively simple to make, cost-effective and reliable even after a prolonged service life. Besides, it allows a rational supply of the tubes by ensuring a constant flow thereof to
30 the associated rewinders also when the capacity of the latter is varied.

These and other advantages and characteristics of the invention will be best understood by anyone skilled in the art from a reading of the following description in
35 conjunction with the attached drawings given as a practical

exemplification of the invention, but not to be considered in a limitative sense, wherein:

- Fig. 1 is a schematic side view of the store being filled;
- Fig. 2 shows the store of Fig. 1 in empty state;
- 5 - Fig. 3 shows the store of Figs. 1 and 2 as the tubes are stocked therein;
- Fig. 4A shows an enlarged detail of the drawing in Fig. 1;
- Fig. 4B shows an enlarged detail of the drawing in Fig. 2;
- Figs. 5A-5H show schematically possible states or operating
- 10 conditions of the store;
- Fig. 6 is a schematic plan view of a store according to the invention.

Reduced to its basic structure and reference being made to the accompanying drawings, a storage unit for cardboard tubes

15 according to the invention has an inlet section (I) and an outlet section for the tubes (1), and an intermediate station (A) in correspondence of which more tubes (I) can stand by, awaiting for the unloading thereof through the outlet section (U).

20 In correspondence of said inlet station (I) provision is made for a conveyor (2) which transport the tubes (I) arriving from a tube-forming machine (known per se and not shown in the figures of the attached drawings).

Provided laterally of the conveyor (2) is a chute (3) which

25 connects the same conveyor (2) to a device (4) which removes and drives out the tubes (1). Such device (4) is intended for transferring the tubes (1) from the conveyor (2) to the intermediate station (A), that is, it has the function of supplying the station (A) with tubes (1) coming from the

30 tube-forming machine.

According to the embodiment exemplified in the figures of the attached drawings, the said device (4) consists of a plurality of horizontal brackets (40) mounted on a plurality of parallel chains (41) ring-like closed onto corresponding

35 pulleys (42, 43) having horizontal axis and associated with

an electric motor (44), so that the ascending section of the chains (41) will result on the side of the conveyer (2) and the descending section will result on the side of the station (A).

5 Similarly, in correspondence of the outlet section (U), provision is made for a conveyor (5) for transporting, towards one or more rewinders (not shown in the drawings), the tubes (1) unloaded from the intermediate station (A).

10 Provided laterally of said conveyor (5) is a chute (6) which connects the same conveyor (5) with a device (7) intended for transferring the tubes (1) from the intermediate station (A) to the conveyor (5), that is, for supplying the latter with tubes (1) unloaded from the intermediate station (A). The said device (7) is substantially identical to the device (4)
15 above described, that is, it comprises a plurality of brackets (40'), mounted on a plurality of parallel chains (41') ring-like closed onto corresponding pulleys (42', 43') having horizontal axis and associated with an electric motor (44') so that the ascending section of the chains (41') will
20 result on the side of the station (A) and the descending section thereof will result on the side of the conveyor (5).

In correspondence of the station (A) which results between the section (I) and the section (U) for the introduction and exit, respectively, of tubes (1), a store of variable
25 geometry is located, the configuration of said store being able to change according to the amount of tubes (1) which can be accommodated downstream, and corresponding to the number of tubes that the rewinders have to be supplied with.

According to the example illustrated in the figures of the
30 attached drawings, the said store comprises a plurality of supports (8), each of which is made up of a central bar or cross-piece (80) on which more rods (81) are fixed orthogonally thereto to cooperate with each other and define a resting plane for a plurality of tubes (1), the said
35 supports being oriented downwardly, that is, with the front

edges (810) of the rods (81) further down than the rear edges (811), so that the said resting plane is an inclined plane. The front edge (810) of each rod (81) is suitably L-bent upwards to prevent the tubes (1) resting against it from spontaneously getting over it.

The distance (d) of one rod (81) from another is suitably chosen so as to form an opening of preset width therebetween. The ends of said bars (80) are kept guided between two pairs of uprights (82). To this end, in correspondence of each end of each bar (80), a flat diagonal element (83, 84) is fixed the ends (830, 840) of which are made to slide onto the inner walls of the uprights (82): the diagonal elements (83, 84) of each bar (80) being mutually crossed, that is, differently inclined relative to the plane defined by the support (8).

Moreover, the said supports (8) are mutually engaged by means of two open side chains (85). More particularly, and as illustrated in Figs. 4A and 4B, the chains (85) are made up of a plurality of links (850) and the diagonal elements (83, 84) of each bar are engaged with selected links of the two chains via corresponding anchoring pivots (851), so that the supports (8) will result hooked up to the two lateral chains in correspondence of the ends of each bar (80).

The said chains (85) are associated with a corresponding electric motor (86) acting from above.

Provided upstream and respectively downstream of station (A), are control photocell means (9, 90) whose function will be described later.

To allow the transfer of tubes (1), carried by the device (4), onto the supports (8) of station (A), provision is made for a plurality of chutes (11) located at a preset distance from the base (B) of the apparatus, parallel to each other, oriented towards the station (A) and disposed staggered with respect to the rods (81) of supports (8) so as not to interfere therewith: the said chutes (11) being mounted between the device (4) and the station (A).

Similarly, to allow the transfer of tubes (1) from the supports (8) to the device (7) of the exit station (U), provision is made for a plurality of fixed chutes (12) disposed at a preset distance from said base (B), parallel to each other, oriented towards the device (7) and disposed staggered with respect to the rods (81) of supports (8) so as not to interfere therewith: the said chutes (12) being mounted between the station (A) and the device (7) and extending towards the station (A).

10 The transfer of tubes (1) from the device (4) to a support (8) standing by, takes place as follows: the descending branch of the chain (41) carries the tubes (1) onto the fixed chutes (11) which intercept them and cause them to roll over the stand-by support (8).

15 The transfer of tubes (1) from a support (8) to the device (7) takes place as follows: the tubes (1) roll over the inclined plane, defined by the support (8), towards the device (7), so that they pass onto the chutes (12) from which they are removed by means of brackets (40') of the ascending branch of chain (41').

20 The operation of the storage unit is as follows. Starting from a condition such as the one shown in Fig. 5A, in which the number of tubes (1) received downstream of station (A) is less than the number of tubes supplied upstream, the tubes (1) pile up onto the "transit" support (8) (that is, on the support that ideally connects the chutes 11 and 12), until the photocell (9) detects a fill-up condition of the support (see Fig. 5B). At this point, the said chains (85) are pulled upwards by the motor (86), so that the filled support (8) moves upwards and its place is taken by the empty support (8) coming from below and which becomes, in turn, a transit support (Figs. 5C, 5D). Once this support also is filled, the same procedure is repeated, until all the supports are filled up (see Fig. 1), in which case the device (4) will be deactivated.

Starting from a condition such as the one shown in Fig. 5E, in which the number of tubes (1) received downstream of station (A) is greater than the number of tubes (1) supplied by the device (4), the transit support (8) empties out, this condition being detected by the photocell (90) as illustrated in Fig. 5F. At this point, the motor (86) drives the chains (85) into a descending motion, so that the empty support moves downwards, and a filled support (8) coming from above takes the place of the empty one (Figs. 5G, 5H). When also this support empties out, the same procedure is repeated, until the emptying out of the store is completed (see Fig. 2), in which case the device (7) will be deactivated.

If the number of tubes (1) received downstream of station A corresponds to that of the tubes fed upstream, the transit support (8) remains in its position.

Owing to the connection of the supports (8) made by connecting members having variable configuration (the side chains 85, in the illustrated example), the whole storage unit takes up a configuration varying according to the number of filled and respectively emptied out supports (8), since the supports (8), which are in stock condition, that is, result above the said "transit" plane, are spaced apart by an extent corresponding to the length of the stretched sections of the chains (85) which connect them (see Fig. 4A), whereas the supports (8) standing by, that is, resulting below the "transit" plane, are closer to each other (see Fig. 4B) because of the peculiar flexibility of the chains (85).

The variable geometry of the above described structure allows keeping the overall height of the store at a minimum.

In any case, whatever the configuration taken up by the store, a transit support (8) defines an inclined plane for connecting the device (4) with the device (7) for supplying, respectively, unloading of tubes (1) without solution of continuity.

Practically, the construction details may vary in any

equivalent way as far as the shape, dimensions, elements disposition, nature of the used materials are concerned, without nevertheless departing from the scope of the adopted solution idea and, thereby, remaining within the limits of

5 the protection granted to the present patent.

CLAIMS

- 1) Store for stocking tubes therein, comprising means (4) for feeding tubes (1) into the store, and means (7) for unloading the tubes (1) therefrom, the store being located between said supply means (4) and said unloading means (7), characterized in that it comprises a plurality of supports (8) each of which defines a plane inclined towards said unloading means (7) and able to receive a plurality of tubes (1) from said supply means (4): each of said supports (8) being movable between a stand-by position where it is empty, a position of transit of tubes (1) in which it defines an inclined plane which connects said tube-supplying means (4) to said tube-unloading means (7), and a stock position in which it is full up.
- 2) Store according to claim 1, characterized in that the movement for disposing said supports (8) to said stand-by, transit and stock positions is developed in the vertical direction.
- 3) Store according to claims 1 and 2, characterized in that the said transit position is intermediate between the stand-by and stock positions.
- 4) Store according to claims 1-3, characterized in that in the said stand-by position, the said supports (8) result below said transit position.
- 5) Store according to claim 1, characterized in that the said supports are connected to each other via two open side chains (85).
- 6) Store according to claim 1, characterized in that each of said supports (8) consists of a central bar or cross-piece to which more rods (81) are fixed orthogonally thereto.
- 7) Store according to claim 1, 5 and 6, characterized in that the said side chains (85) are connected to said bars (80).
- 8) Store according to one or more preceding claims, characterized in that, in correspondence of said means (4) for feeding the tubes (1), provision is made for a plurality

of fixed chutes (11) oriented towards the store, and in that, in correspondence of said means (7) for unloading the tubes (1), provision is made for a plurality of fixed chutes (12) oriented towards the same means (7) and extending towards the store.

9) Store according to one or more preceding claims, characterized in that it comprises two pairs of uprights (82) which act as guides for said supports (8).

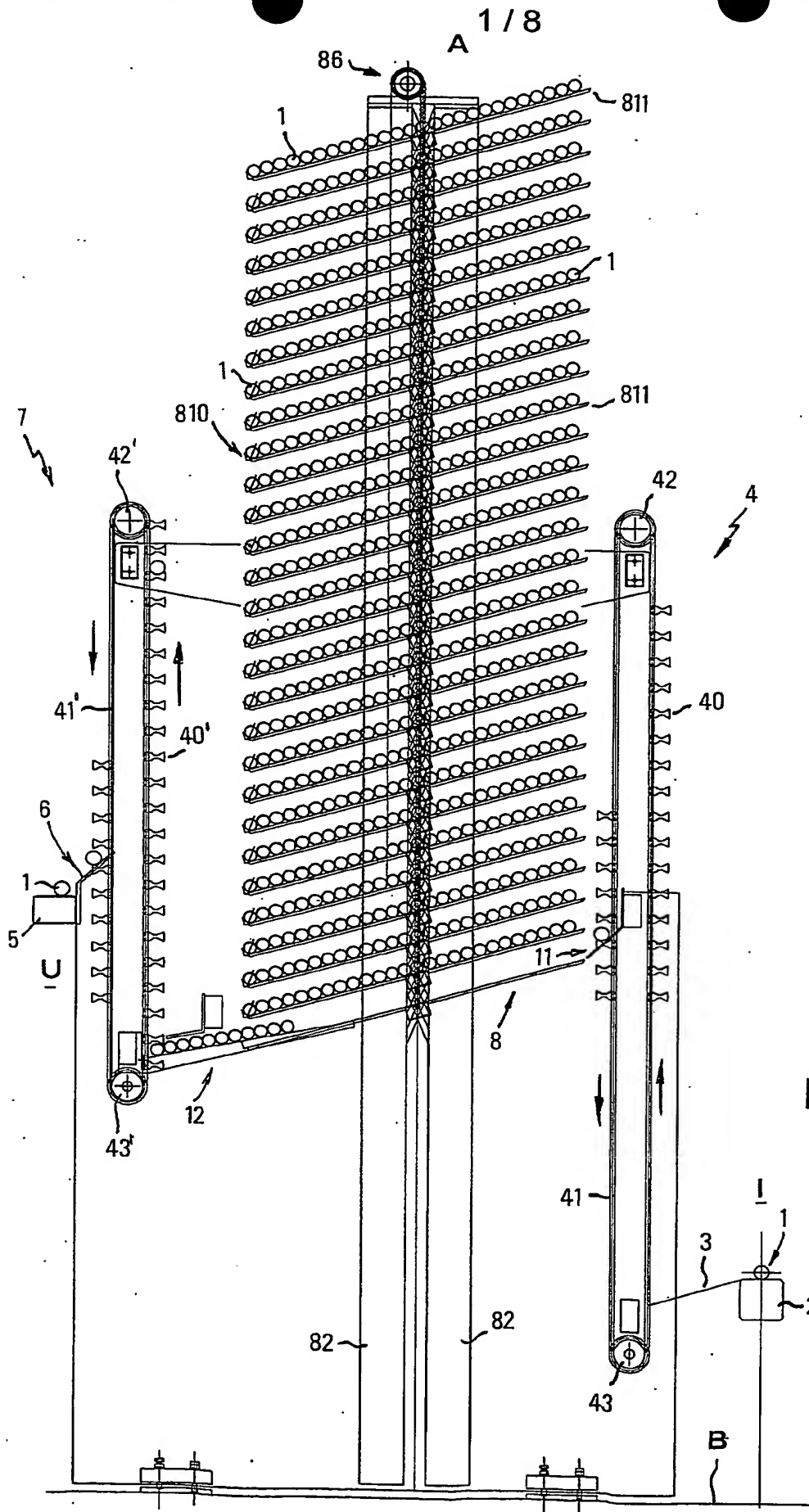
10) Store according to one or more preceding claims, characterized in that it has a variable geometry.

AMENDED CLAIMS

[Received by the International Bureau on 29 March 2004 (29.03.04) ;
original claims 1 and 5 amended ; remaining claims unchanged]

- 1) Store for stocking tubes therein, comprising means (4) for feeding tubes (1) into the store, and means (7) for unloading the tubes (1) therefrom, the store being located between said supply means (4) and said unloading means (7), the store comprising a plurality of supports (8) each of which defines a plane inclined towards said unloading means (7) and able to receive a plurality of tubes (1) from said supply means (4), each of said supports (8) being movable between a stand-by position where it is empty, a position of transit of tubes (1) in which it defines an inclined plane which connects said tube-supplying means (4) to said tube-unloading means (7), and a stock position in which it is full up, characterized in that said supports (8) are connected to each other via connecting members having variable configuration.
- 2) Store according to claim 1, characterized in that the movement for disposing said supports (8) to said stand-by, transit and stock positions is developed in the vertical direction.
- 3) Store according to claims 1 and 2, characterized in that the said transit position is intermediate between the stand-by and stock positions.
- 4) Store according to claims 1-3, characterized in that in the said stand-by position, the said supports (8) result below said transit position.
- 5) Store according to claim 1, characterized in that the said connecting members are two open side chains (85).
- 6) Store according to claim 1, characterized in that each of said supports (8) consists of a central bar or cross-piece to which more rods (81) are fixed orthogonally thereto.
- 7) Store according to claim 1, 5 and 6, characterized in that the said side chains (85) are connected to said bars (80).

- 8) Store according to one or more preceding claims, characterized in that, in correspondence of said means (4) for feeding the tubes (1), provision is made for a plurality of fixed chutes (11) oriented towards the store, and in that,
- 5 in correspondence of said means (7) for unloading the tubes (1), provision is made for a plurality of fixed chutes (12) oriented towards the same means (7) and extending towards the store.
- 9) Store according to one or more preceding claims,
- 10 characterized in that it comprises two pairs of uprights (82) which act as guides for said supports (8).
- 10) Store according to one or more preceding claims, characterized in that it has a variable geometry.

**Fig. 1**

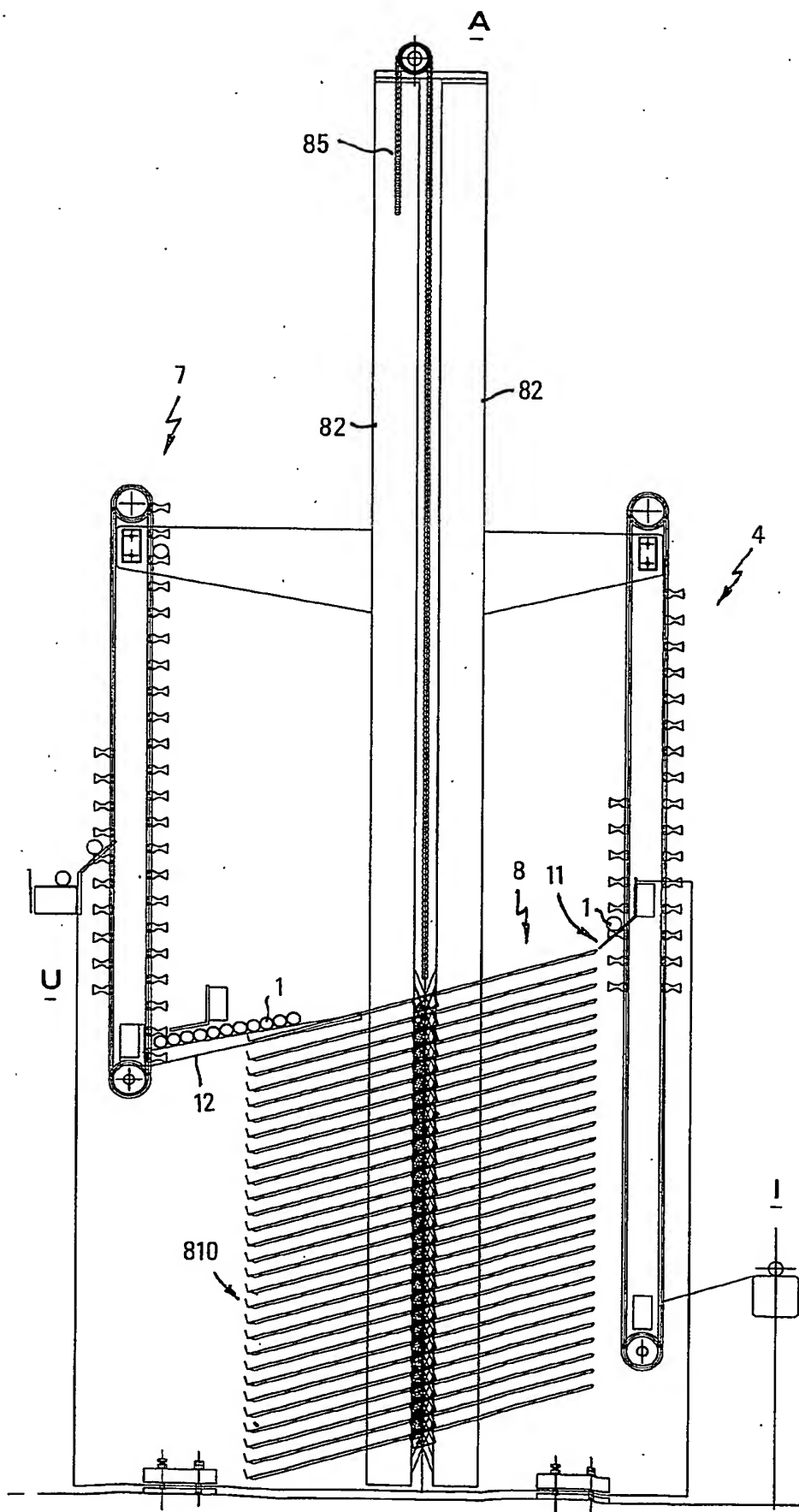
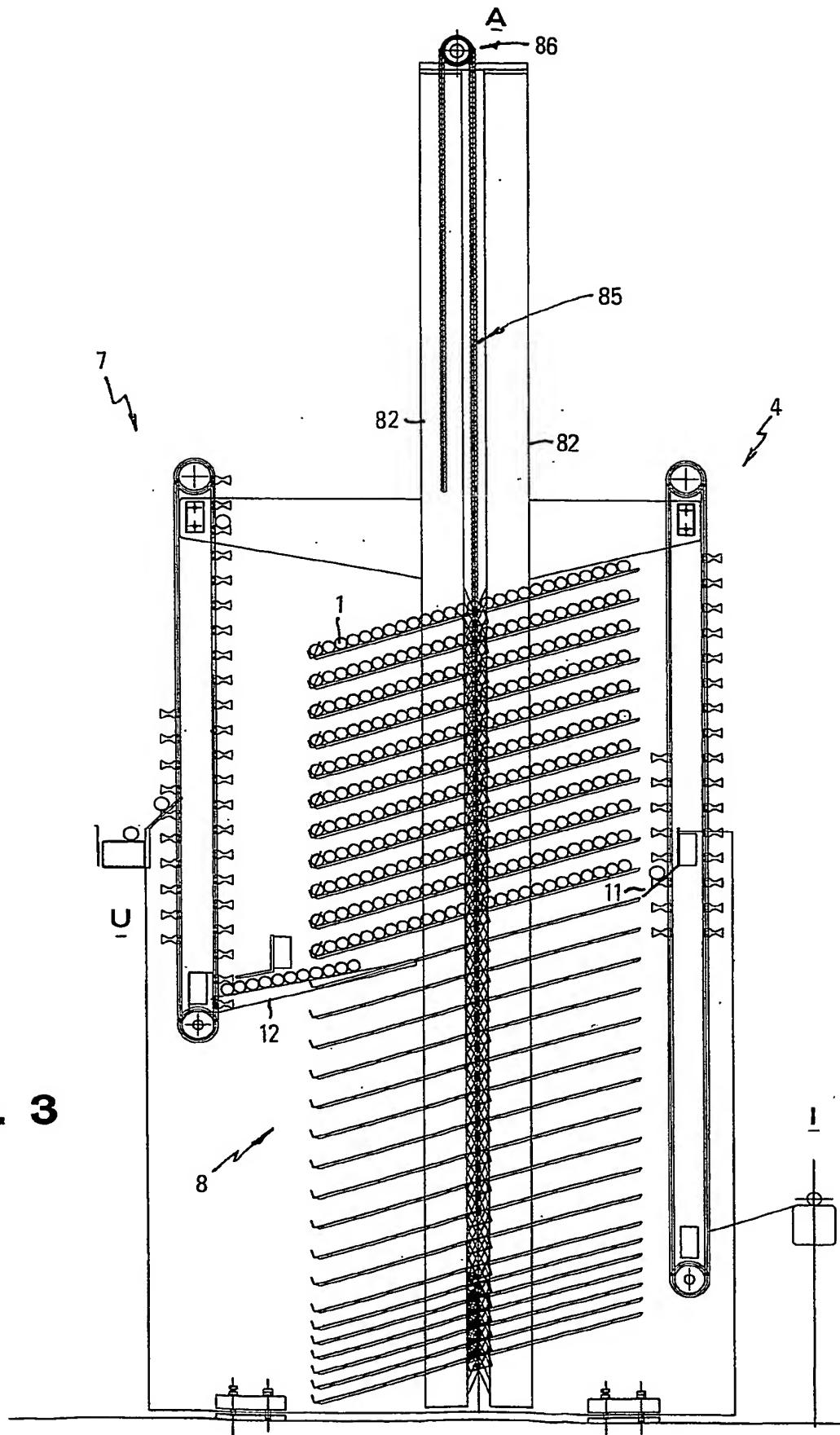


Fig. 2

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**Fig. 3**

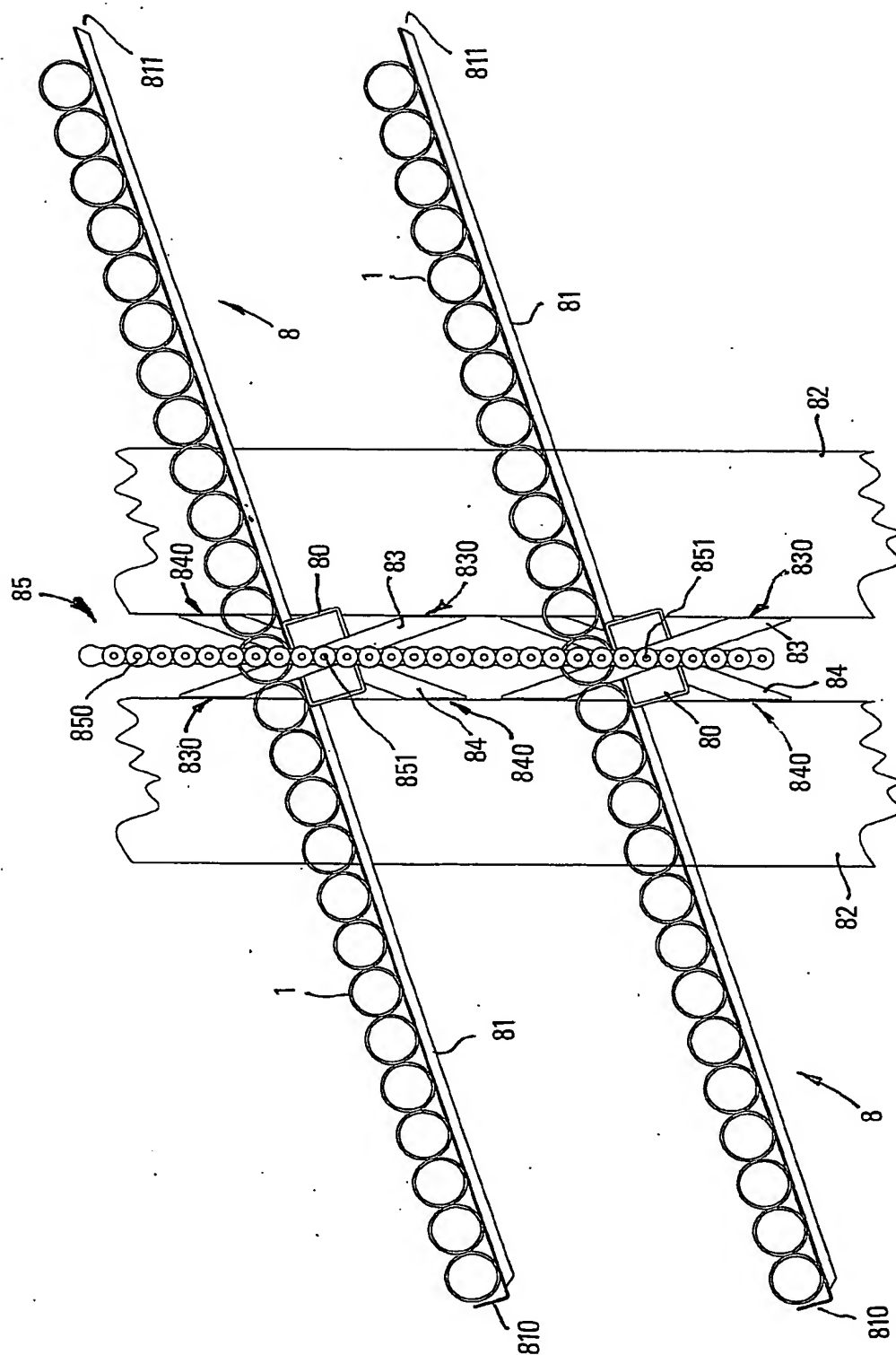


Fig. 4A

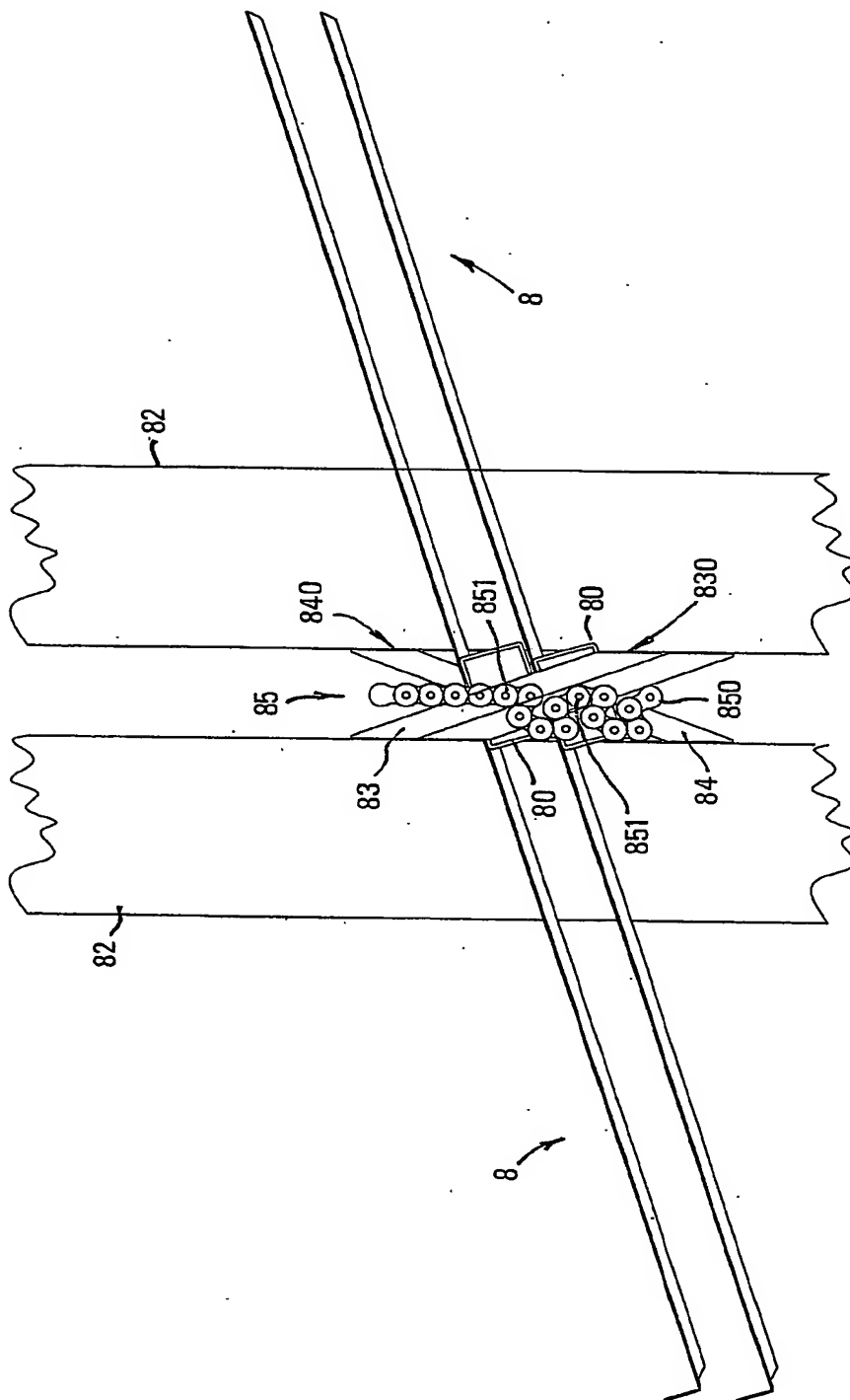


Fig. 4B

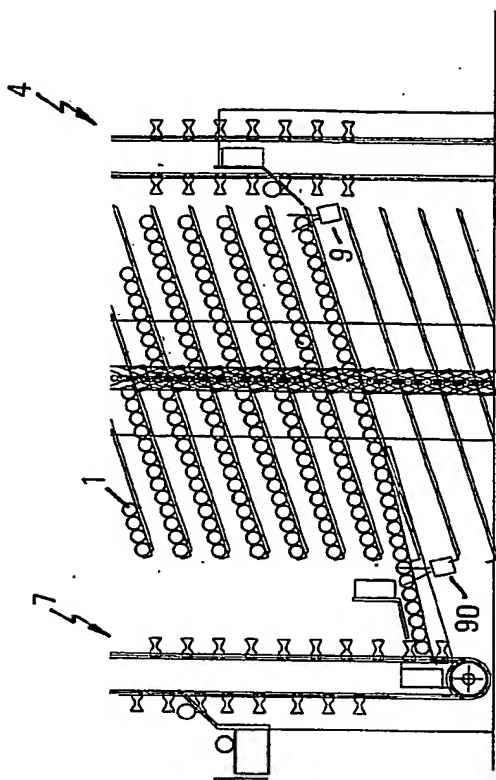


Fig. 5A

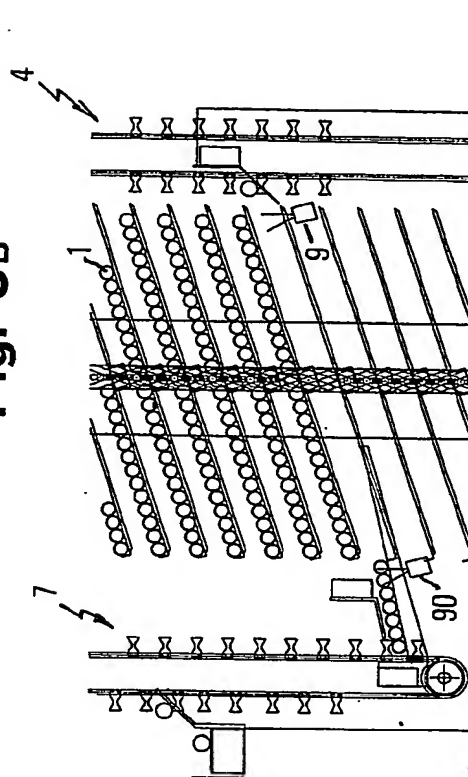


Fig. 5B

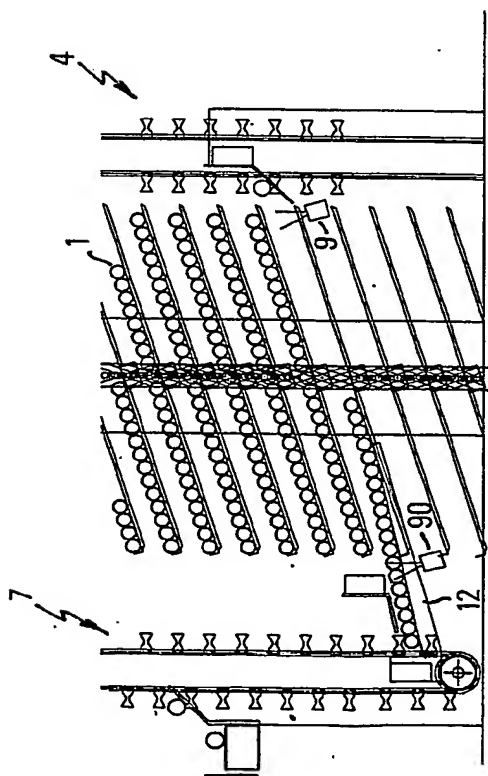


Fig. 5C

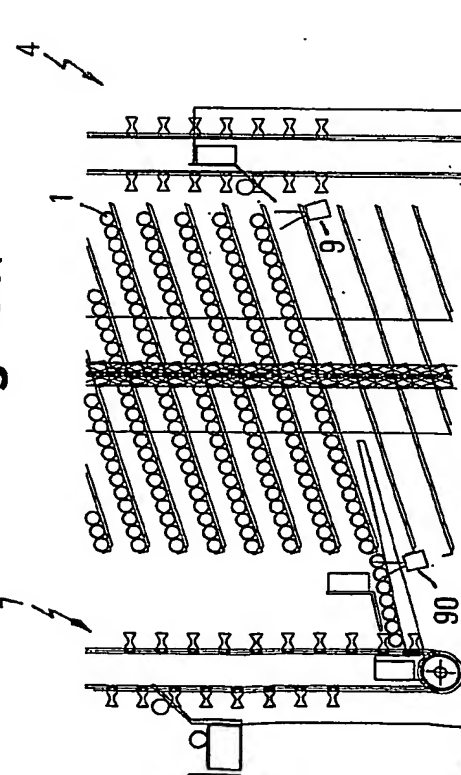


Fig. 5D

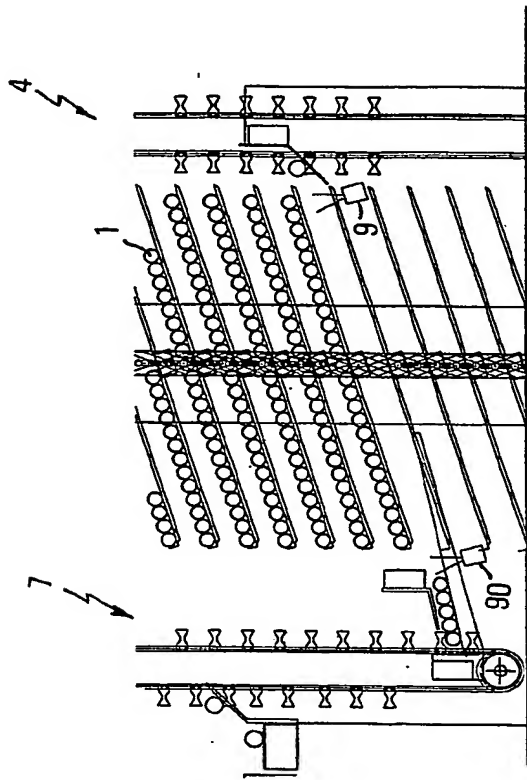


Fig. 5F

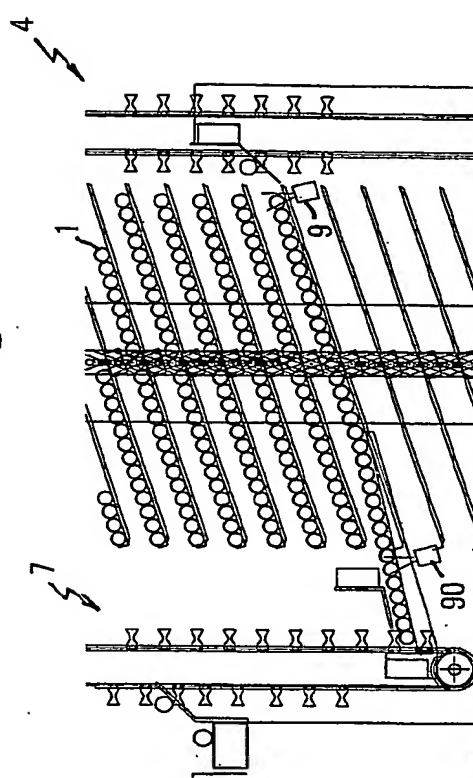


Fig. 5H

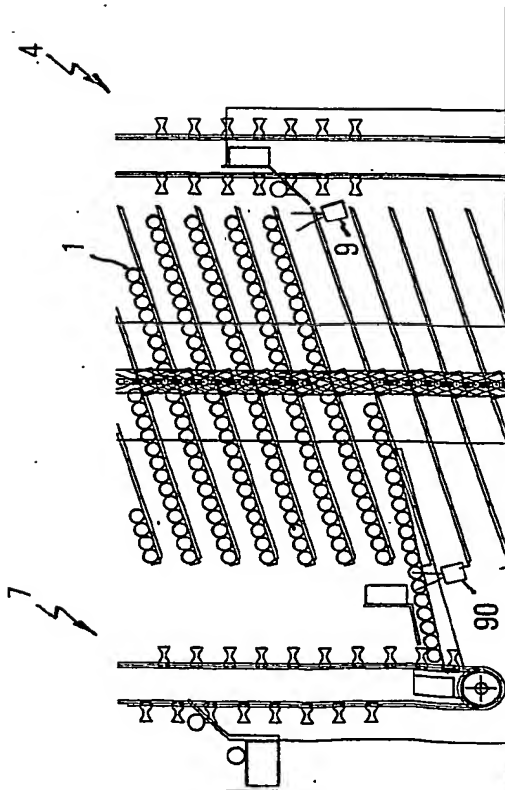


Fig. 5E

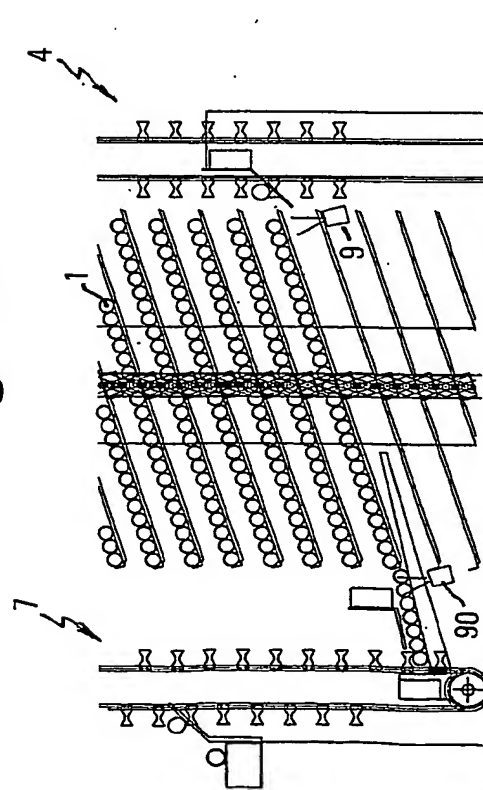
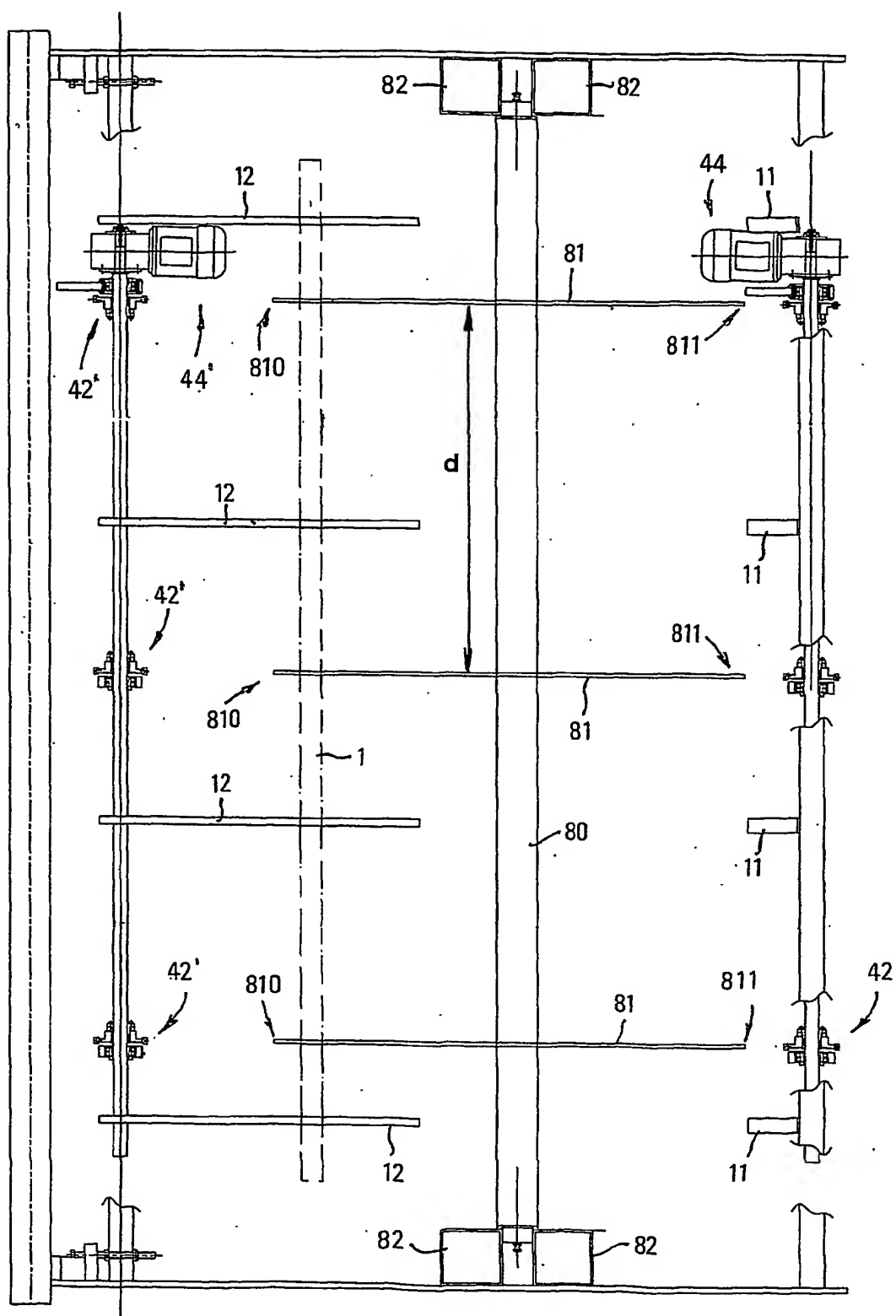


Fig. 5G

**Fig. 6**

INTERNATIONAL SEARCH REPORT

In  Application No
PCT/  03/00639**A. CLASSIFICATION OF SUBJECT MATTER**
IPC 7 B65G47/51

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHEDMinimum documentation searched (classification system followed by classification symbols)
IPC 7 B65G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 470 538 A (BAYER ISOLIERGLASFAB KG) 12 February 1992 (1992-02-12) column 1, line 1 - line 48; figures 1-3 ---	1-4, 6, 9, 10
X	GB 2 011 870 A (TI TUBE DIVISION SERVICES LTD) 18 July 1979 (1979-07-18) page 1, line 4 - line 43; figure 1 ---	1-4, 6, 9, 10
A	US 6 053 304 A (BIAGIOTTI GUGLIELMO) 25 April 2000 (2000-04-25) column 1, line 6 - line 48; figure 1 ---	1
A	US 327 868 A (LOTHAR MÜLLER) 27 June 1967 (1967-06-27) column 1, line 13 - line 55; figure 1 ---	
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Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

24 February 2004

Date of mailing of the international search report

02/03/2004

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INTERNATIONAL SEARCH REPORT

Int'l Application No
PCT 03/00639

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>PATENT ABSTRACTS OF JAPAN vol. 005, no. 190 (M-100), 4 December 1981 (1981-12-04) & JP 56 113603 A (KAWASAKI STEEL CORP), 7 September 1981 (1981-09-07) abstract; figure 1</p>	

INTERNATIONAL SEARCH REPORT

tion on patent family members

Int'l Application No

PCT 03/00639

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GB 2011870	A	18-07-1979	NONE	
US 6053304	A	25-04-2000	IT FI950075 A1 AT 176890 T AU 5345996 A BR 9608051 A CA 2218690 A1 CN 1182402 A ,B DE 69601575 D1 DE 69601575 T2 EP 0824490 A1 ES 2127633 T3 GR 3029900 T3 WO 9633114 A1 JP 11503708 T PL 322973 A1 RU 2134229 C1	21-10-1996 15-03-1999 07-11-1996 17-02-1999 24-10-1996 20-05-1998 01-04-1999 29-07-1999 25-02-1998 16-04-1999 30-07-1999 24-10-1996 30-03-1999 02-03-1998 10-08-1999
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